IT Investment and Firm Performance in U.S. Retail Trade*

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Abstract

We examine the relationship between investments in information technology (IT) and two measures of retail firm performance - productivity and establishment growth - over the 1992 to 1997 period. We use untapped firm and establishment micro data from the Censuses of Retail Trade and the Assets and Expenditures Survey. We show that large firms account for most retail IT investment, employment and establishment growth. We find evidence of a significant relationship between IT investment intensity and productivity growth. We found no such evidence of a link between IT and growth in the number of establishments operated by retail firms.

Keywords: information technology, retail, productivity, establishment growth

JEL Classification: O31, L81

1 Introduction

The recent slowdown notwithstanding, the performance of the U.S. economy over the past decade has been impressive. The recent period of strong economic and productivity growth coincided with an investment boom, particularly in computers and other forms of information technology (IT). Many observers point to these as evidence of a new economy driven largely by improvements in, and greater utilization of, IT. Indeed there is evidence that this in case. Aggregate level studies (Jorgenson and Stiroh 2000; Oliner and Sichel 2000; Schreyer 2000), and micro level analyses (Brynjolfsson and Hitt, 1995; Dunne

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et. al 2001) suggest a link between IT and productivity. However, the evidence in support of a new economy link between IT and economic performance is not overwhelming. Industry level studies (Stiroh 1998) find no link, and micro level studies are concentrated in the manufacturing sector or use small, select samples of firms.

Progress in this area has been hampered by the lack of appropriate data. Many of the sectors where IT is used most intensively are where measurement by official economic statistics is the weakest (Bosworth and Triplett 2000; Haltiwanger and Jarmin 2000). As a result, the relationship between IT and firm performance in the trade and service sectors is poorly understood. Statistical agencies are keenly aware of the measurement challenges facing them and that changes underway in the economy are making the task of measuring it more difficult. The Census Bureau has been aggressive in trying to address the needs of data users arising from the new economy by initiating new measurement initiatives, adding questions to existing surveys and finding new ways to more fully utilize existing data resources (Atrostic, Gates and Jarmin 2001).

In this paper, we take that latter path and use previously untapped micro level data collected by the Census Bureau to analyze firm performance in the retail trade sector focusing on the role of information technology (IT). We extend the rich literature that analyzes establishment and firm performance with Census micro data for the manufacturing sector to other significant portions of the economy.[1]

In analyzing firm performance in the retail trade sector, we face several hurdles. First, the quantity and quality of information available to measure firm or establishment productivity in the retail sector is much poorer than in manufacturing. In particular, measuring output is problematic and there is little information collected on inputs. We don't offer much in terms of solving these problems and follow the standard practice of measuring productivity with sales per employee. This is a simple measure and intuitively appealing for the retail sector. Calculating other measures of productivity, such as value added per worker or multi factor productivity, for the retail sector at the firm or establishment level is prohibitively difficult.

An additional hurdle in examining firm performance in the trade sector arises from the fact that the data we are using are collected in a variety of surveys using different statistical units. In manufacturing, establishment level data on the dollar value of inputs and output are collected in a single survey, the Annual Survey of Manufacturers. Unfortunately, in the trade sectors, the variables needed to construct just one key measure of firm performance, labor productivity, are scattered across different surveys that employ different sampling frames and units of observation. Below we discuss how we combined data from various sources to conduct this study. Indeed, one of the contributions of this paper is exploring how to analyze firm performance outside of the goods producing sectors using Census Bureau micro data.

[1] Foster, Haltiwanger and Krizan (1998) and Bartlesman and Doms (2000) both discuss the usefulness of using micro data in understanding a variety of issues including aggregate productivity growth.

2 Basic facts and hypotheses about the retail trade sector

Retail trade accounts for a large and growing portion of U.S. economic activity. The upper panel of table 1 presents output by sector from BEA's Gross Product Originating Database–output corresponds to value added, so that the sum across all sectors equals GDP. The trade sectors (both retail and wholesale) share of output was about the same as that of manufacturing in 1999, about 16 percent. However, the share for the trade sector has grown significantly faster than manufacturing since 1992.

The second panel in table 1 shows employment by industry. Trade sector employment was about 60 percent greater than manufacturing employment in 1999. As in output, the growth in employment has been greater in the trade sector than in manufacturing, especially in retail.

The third panel in table 1 compares a crude measure of labor productivity–output per employee (a better measure would be output per hour, but the qualitative results remain the same)across the sectors. Since 1992, productivity growth in the trade sectors and in manufacturing averaged a bit more than 4 percent per year, greater than the average for the entire economy. Given the great interest surrounding the rebound in aggregate productivity growth since 1995, it is interesting that the retail sectors productivity growth also picked up.

This strong productivity performance, especially that observed in the trade sectors, was unexpected and is still not well understood. What is behind the improved productivity performance of the retail sector? One hypothesis is that relatively productive firms, such as Wal-Mart or Starbucks, open a large number of establishments, increasing the market share of these firms. Relatively inefficient firms (K-Mart and Brothers Coffee) are driven out of the market. One factor that may make the Wal-Mart's of the world successful is their use of information technology. Not only does Wal-Mart make substantial investments in IT, Wal-Mart knows how to make these investments pay-off more so than other firms. This know how might be manifested in better supply chain management, different workplace practices or organizational design. While their analysis does not focus on retail, Bresnahan, BrynjoIfsson and Hitt (1999) show that changes in organizational structure are complementary with IT investment in productivity regressions.

Foster, Haltiwanger and Krizan (2001) decompose aggregate productivity growth in the retail sector using data from the Censuses of Retail Trade. They find that most productivity growth comes from the net entry of establishments. That is, low productivity establishments exit and are replaced by high productivity new entrants. Looking more carefully at the characteristics of these high productivity entrants, they find that entering plants owned by existing firms are the most productive. This finding is consistent with the Wal-Mart type stories described above.

3 Data

We use micro data from two Census Bureau programs since no single program collects data on all the variables we need. First, we use establishment level data from the 1992 and 1997 Censuses of Retail Trade. The Census of Retail Trade (CRT) files contain information on the universe of retail establishments and are the source for the measures of labor productivity we use below. To construct measures of total capital and computer investment, we use the 1992 Assets and Expenditures Survey (AES).

While performed as part of the 1992 Economic Census, the sampling frame for the retail portion of the AES was the one used, at the time, for the Monthly and Annual Retail Trade Surveys. As a result, the sampling units in the 1992 AES are substantially different from the establishment units used in the CRT. Differences in sampling units and methodology across the Census and the AES make merging the information from them difficult. Below we describe the methods we employed to create the matched research data set used in the analysis.

It is possible to match production and investment data at the establishment level for the manufacturing sector only. Prior to 1994, the only source of investment data for the retail sector was the AES. In 1997, the AES was renamed the Business Expenditure Survey (BES) and nearly all investment questions were removed from the survey. The Census Bureau started conducting the the Annual Capital Expenditures Survey (ACES) in 1994. The ACES is a firm level survey and only occasionally asks for investment by detailed type of equipment, such as computers. In 1998, the Annual Capital Expenditure Survey (ACES) asked firms to break out capital expenditures by equipment type for their companies three primary industries. Trying to reconcile the reporting units used in the 1992 AES and the 1998 ACES, in order to create time series investment data for retail, is beyond the scope of this paper. However, we hope to do this in the future.

3.1 Census of Retail Trade

As part of the Economic Census carried out every 5 years, the Census Bureau collects data for the universe of retail establishments. In an effort to reduce reporting burden on smaller businesses, only establishments with a specified minimum number of paid employees (this number varies by industry, but is generally around 10) are canvassed. Administrative data are used for small employer and non-employer establishments that are not mailed Census forms. Primary data on payroll, employment, sales, location and industrial classification are obtained for all retail establishments (both the mail and non-mail segments). Additional information on merchandise lines and selected other items are collected from the mail segment. For the current analysis, we are interested only in the base information on sales, employment and so on.

An establishment is a single physical location where business is conducted. The frame for the CRT, and other Economic Censuses, is the Standard Statistical Establishment List (SSEL). Since administrative data from the SSEL

are used directly in the CRT and because the CRT and SSEL share a common structure its useful to briefly describe the SSEL.

The SSEL has two principal components. First, the Census Bureau receives information on taxpaying businesses from the Internal Revenue Service (IRS). This information corresponds to legal tax paying entities and the unit corresponds with the Employer Identification Number (EIN). The majority of businesses, in and outside of retail, have only one location. In these cases, the EI administrative reporting unit the Census receives from the IRS and the establishment are the same thing. When a new single unit establishment EIN arrives on IRS files, Census assigns both a Census File Number(CFN) and a Permanent Plant Number (PPN). Both numbers are unique to a physical establishment. However, the CFN is intended to incorporate information about the ownership of the establishment and can change as the ownership or other legal aspects of the establishment change. The PPN remains the same as long as the establishment remains open in the same location, even if it changes hands.

Second, the Census Bureau annually surveys multi-location companies inquiring about the location, employment and industrial classification of all their establishments. The Company Organization Survey (COS), the Economic Censuses and other surveys are used to maintain the list of multi-unit (those owned by multi-location companies) establishments. Multi-unit establishments are also assigned CFNs and PPNs. Again, they are unique to the establishment and the CFN contains information about the ownership of the establishment. Unlike in the single unit case, where they all refer to the same thing, the EI administrative reporting unit, the firm and the establishment can be very different for multi-units. This means the numeric identifiers: EIN, CFN and PPN all refer to different units. For multi-unit establishments, the CFN contains an ALPHA code which identifies the firm that owns the establishment. An ALPHA can own many EINs, each of which can have several PPNs and CFNs associated with them.

This ID structure is mapped directly to establishments in the CRT. These IDs allow researchers to can link establishments, firms and firm segments across different surveys. In most cases, these links are between like units (e.g., PPN to PPN or ALPHA to ALPHA). This is not the case when linking the AES and the CRT as our discussion of the AES below shows.

3.2 1992 Asset and Expenditures Survey

Data on total capital expenditures and computer investment for the retail sector in 1992 are available from the 1992 Asset and Expenditure Survey (AES), done as part of the 1992 Economic Census. As mentioned above, the sampling frame for the 1992 AES was the same as that for Annual and Monthly Retail Trade Surveys. These surveys use significantly different sampling units than the establishments used in the CRT. The 1992 AES, following the sampling methodology of the Annual Retail Trade Survey (ARTS) was comprised of a list sample and an area sample. We do not use any of the data from the area sample, so we don't discuss it here (see U.S. Census Bureau, 1996 for discussion of the area

sample). The list sample has two sub-lists for different types of records, EI and ALPHA records.

Large multi-location retailers identified from the 1989 Company Organization Survey (COS) make up the first (ALPHA) list. Their establishments (and their corresponding EINs) were removed from the SSEL before drawing the EI list sample. The remaining establishments and their corresponding EINs make up the EI list. Most of the units in the ALPHA list are large multi-unit retailers that were selected in to the ARTS and, thus, the AES with certainty. These units typically correspond to an entire large retail company, but some larger retailers can have more that one reporting unit where the units are separated by major kind of business, and still others may have kinds of business that are out of scope for the CRT (e.g., wholesale or manufacturing establishments).

Smaller multi-unit and single unit retailers are contained in the EI sub-list. The ARTS chooses three rotating probability samples from this list and the AES uses two of the three. For all businesses in the EI list, the EIN is the sampling unit. Therefore, it is possible for a multi-unit EI list company with more than one EI to be represented in the AES more than once, but for distinct segments of the firm.

3.3 Matching the AES to the CRT

It is not possible to obtain exact unit to unit matches between the AES and the CRT for all multi-unit retailers. There is not an accurate mapping between the sampling units on the AES (identified numerically by AESID) and the establishments in the CRT that the AES sampling units are intended to represent. This is due to timing issues relating to drawing the ARTS/AES sample and when the CRT is collected. In addition, the ARTS is voluntary and the Census Bureau grants companies some latitude in how they report in order to obtain their participation in the survey.

Matching the AES to the CRT is not too problematic for EI cases since the EI sampling unit in the AES is intended to cover all establishments (usually only one) operating under a given EIN. The ALPHA cases, which account for a large amount of retail activity, are more difficult to match. The unit of analysis, in these cases, can be thought of as an ALPHA - kind of business combination. That is, the sampling unit is intended to describe the activities of a company within a given industrial classification.

The 1992 AES contained 20,355 EI units and 2,810 ALPHA units. The ALPHA units collapse to 2,024 ALPHA two-digit SIC combinations. We matched 15,498 of the 20,355 EI units to the CRT. These EIs corresponded to 32,731 establishments. We matched 1,631 of the 2,024 ALPHA two digit SIC units (2,385 of the 2,810 ALPHA units) to the CRT. These companies had 228,982 establishments in the 1992 CRT. The result is a matched dataset with 17,129 firms. Note, what we are calling a firm does not always match the legal definition for many large enterprises.

The AES retail sample is intended to be representative of the retail sector. Because we did not match every AES unit to the Census, we adjust the AES

sample weights as follows:

$$adjwgt_{ij}^{s} = wgt_{ij}^{s} * \frac{\sum_{k \in A_j^s} sales_k}{\sum_{l \in M_j^s} sales_l}$$

where i, k and l index firms, j indexes 2-digit SIC industries and s indexes the pair {EI, ALPHA}. The term in the numerator is the weighted sum for all AES firms in industry j and set s, and the term in the demoninator is the same sum for those firms that we matched to the CRT. We compute adjusted weights separately for EI and ALPHA cases since the sample weights are so different (the median AES sample weight for ALPHA units in 1 and for EI units its 15.25). Note that even after adjusting the weights, our totals will not match those in official Census publications since we are omitting the AES area sample.

4 Results

Our goal is to better understand the processes generating productivity growth and improved firm performance in the retail trade sector. The matched AES-CRT dataset we constructed allows us to exploit cross sectional variation in the intensity of computer and total capital investment to see if firms that invested heavily in 1992 enjoyed more productivity growth over the 1992 to 1997 period.

Productivity is only one measure of firm performance, however. In addition, productivity measurement in retail is difficult owing to problems with defining and measuring retail output (as opposed to retail sales) and finding data on inputs at the micro level. Therefore, we are interested in looking at the impact of IT on other dimensions of retail firm performance in addition to productivity growth. In the retail sector, perhaps more so than other sectors, increases in the number of establishments retail firms operate are good signals of firm success. Retail markets are primarily local. Expanding into new retail markets typically involves opening a store in that market. Expanding into new markets by opening additional establishments is a good signal of retail firm success. An appealing feature of this metric for our purposes is that we have high quality data on firm establishment growth.

Our empirical framework is straightforward. Our preference would be to estimate production functions. However, the quality and quantity of the data available prevent us from doing so. The only input we observe on the CRT is total employment. We can not measure the capital stock, only investment for one period. Further, sales is a crude measure of output and we do not have firm specific deflators, which are important in a sector with large quality differentials between firms operating inside well-defined industries.

Thus, we do not estimate structural production function parameters and instead employ simple regressions with the hope describing the relationships between proxy measures in the data. This is also why we chose to examine different metrics of retail firm performance. We regress measures of retail firm performance on a measure of IT investment intensity as well as some controls as in the following:

$y_j = f(IT_j, I_j) + \beta_s size_j + \beta_I IND_j + \mu_j$

where j indexes firms and IT_j is a measure of IT investment intensity, I_j is a measure of total investment intensity, size and IND are vectors of employment size and two-digit SIC dummies, respectively and μ is an error term. Performance, y_j, is measured as the change between 1992 and 1997 and all right hand side variables are measured in 1992. We use two alternative parameterization of the IT_j and I_j terms. Construction of the measures we use is described in more detail below.

4.1 Descriptive Results

Tables 2 and 3 contain descriptive statistics for the firm units we constructed from the CRT. All establishments, in both the 1992 and 1997 CRTs, are represented. We list the number of firms in each year as well as the number of surviving, or continuing, firms by size class. Table 2 shows that there is considerable turnover amongst retail firms, especially in the smaller size categories. More than half of the firms in the 0 to 9 size class in 1992 exit before 1997.

Work by Foster, Haltiwanger and Krizan (2000) suggests that net entry of establishments drives most aggregate retail productivity growth over a similar time period. We do not decompose productivity growth as do Foster et. al., but our results suggest that changes to the retail sector caused by the net entry of establishments are dominated by large continuing firms. Results in Table 2 show that large continuing retailers contributed more than two-thirds (26,494 of 34,980) of the increase in retail establishments between 1992 and 1997. Even more importantly perhaps, is the fact that large retailers contributed approximately 71% of the over 2.7 million net increase in retail employment over the 1992 to 1997 period! Large retailers add more retail establishments and jobs than do their smaller counterparts and are accounting for a larger portion of overall retail activity in the U.S. While, this result should seem obvious to most U.S. consumers, it is the opposite of the trends we have observed in the manufacturing sector, where large firms have reduced their employment share but have increased the productivity gap vis à vis small firms (Baldwin, Jarmin and Tang 2001).

Table 3 gives some basic statistics for labor productivity (sales per worker) for 1992 and 1997 and gives the average firm level change in productivity. All productivity calculations are nominal. The results suggest that the productivity performance of large retailers is rather similar to all but the smallest firms.

4.1.1 Matched AES-CRT Sample

Table 4 shows descriptive statistics for our matched sample of AES-CRT data. The AES covers most large retailers with certainty in order to cover as much retail activity as possible, while holding the sample size and respondent burden to a minimum. As a result, even though our matched sample only covers 17,129 of the 1,071,737 retail firms in the 1992 CRT, it covers a sizable portion of retail employment and sales. Productivity growth between 1992 and 1997 does not vary strikingly across the size distribution, as was the case for retail as a whole.

Firms in the matched sample do tend, however, to be larger and more productive than the typical firm in the entire retail universe. However, the row showing the average weighted productivity growth for the matched sample is quite similar to the row in table 3 showing the same thing for all firms. Table 4 also lists means for average total and IT investment by size class. Large firms account for most retail investment - they accounted for over half of all investment in IT by retailers in 1992.

We want to measure the cross sectional variation in total and computer capital intensity. Ideally, we would want a measure of total and computer capital stocks and normalize them with some measure of size such as employment, payroll or sales. The AES asks for total capital expenditures and expenditures on selected types of equipment, such as computers. It does not collect information on stocks of IT equipment and we don't have time series data available at the firm level to construct capital stock measures. However, previous work with manufacturing data shows that the patterns of cross sectional variation in investment and capital stocks are very similar. Therefore, we proxy total capital and computer intensities with, respectively, total and computer investment per dollar of payroll. We use the payroll measure available on the AES as opposed to that on the CRT to mitigate measurement error introduced by matching the two data sources.

In table 5, we provide basic statistics on establishments, employment and productivity by capital and computer investment intensity categories. Firms are categorized as having high total investment if they were above the 75th percentile of total investment spending per dollar of payroll. Similarly, firms were classifies as having high IT investment if they were above the 75th percentile of IT per dollar of payroll. The table shows striking differences in the productivity performance of firms according to capital and computer intensities. Also, establishment and employment growth for the matched AES-CRT sample is concentrated entirely among firms with high capital and/or computer intensities. The productivity growth premium to having both the high total and high computer intensities is particularly interesting.

Let us next compare the characteristics of the firms in the matched subset used in our regressions to the entire retail population. Our regressions are basically a cross sectional analysis of firms present in both 1992 and 1997 using 1992 characteristics as regressors. Tables 6 and 7 show some basic statistics on the number, size, number of establishments and productivity for all firms, and for our matched subset. Table 7 also lists statistics on capital and computer expenditures for the matched AES-CRT subset. Characteristics are given by 2 digit SIC in both tables. As expected, firms in the matched subset are much larger and more productive than the general population of retailers. Interestingly, there is no obvious correlation between the intensity of computer investment in a 2-digit industry and its productivity growth.

4.2 Firm Level Regression Results

To get a better handle on the role that investments in IT have in firm performance, we turn now to some simple firm level regressions. We use two dependent variables in our analysis: labor productivity and establishment growth between 1992 and 1997. The construction of these measures means our analysis focuses on those firms that were active in both years. This could be a problem in light of the findings of Foster, Haltiwanger and Krizan (2000) who show that net entry accounts for a large portion of aggregate productivity growth in the retail sector. However, recall their results are based on the net entry of establishments. We are looking at firms here and, as table 2 shows, continuing firms (especially large ones) account for a substantial portion of net establishment entry.

4.2.1 Productivity Growth Results

We are interested in seeing whether retail firms that use more capital, both IT and total, experience more productivity growth and are more likely to expand their operations through increased sales or by increasing the number of retail establishments. We use two measures of IT in the regressions. First, we the total and IT investment intensity categories used in table 5. The other specification for IT investment is to enter IT as the share of total investment (IT/I) as in Dunne et. al. (2001).

Table 8 contains results from regressions looking at the impact of total and IT investment intensities on labor productivity growth between 1992 and 1997 using both measures of IT. The regressions control for firm size, average (within firm) wage, and two-digit SIC. Recall that the boundaries for the investment intensity categories used in model 1 of table 8 correspond the 75th percentiles of the total and IT investment distributions. The results from model 1 show a substantial productivity growth premium for firms that invested heavily in both IT and total investment in 1992. Within the high total investment group of firms, we see that there is a monotonic (but not statistically significant) relationship between increased IT investment intensity and productivity growth. However, this is not the case for firms in the low total investment group. We used alternative boundaries for the categories and the results are qualitatively similar. Moving the category boundaries lower down the investment intensity distribution reduces the size the productivity growth premium.

Models 2 and 3 use the IT share of total investment measure. While the coefficient on the IT share variable is positive and large, it is only marginally significant (at the 6% level) without including a measure of total investment intensity. Including a dummy for high total investment intensity increases the magnitude and (statistical) significance of the coefficient on IT share of investment.

We find evidence of a relationship between IT spending and productivity growth using two alternative measures of IT investment intensity. The results in model 1 show, however, that firms with high IT spending but low overall investment spending performed no better than firms that reported no investment

at all. This suggests that improved performance is the result of multiple actions taken by firms, one of which is investing in IT.

4.2.2 Establishment Growth Results

Table 9 shows results from similar regressions where the dependent variable is the log change in the number of establishments at retail firms. This measure of overall firm performance makes sense in the retail sector. Even with the Internet and catalogue shopping, most retail markets are local. A firm's participation in a given market is indicated by the presence of one its establishments in that market. Successful retail firms expand into additional local retail markets and increase the number of establishment they operate.

Unlike the case for productivity growth, we find no evidence of a significant relationship between IT investment and retail firm establishment growth over the 1992 to 1997 period. The estimated coefficients have the correct signs, but their magnitudes are small with large standard errors. However, there is considerably less variation in establishment growth than there is in productivity growth. In addition, the mechanisms that drive establishment growth may be only tangentially related to IT spending. Cross firm differences in retail establishment growth are likely to be related to advertising, brand management, merchandise selection and other strategies that influence consumer demand. IT spending has at best a second order affect.

5 Conclusions

The retail trade sector in the U.S. has experienced considerable growth over the last several years. In addition, the sector has enjoyed substantial productivity growth over the same period. The reasons for this impressive performance are not well understood and there is, generally, little focus on the sector by researchers. Part of this lack of attention can be attributed to a lack of good micro level data with which to study the retail sector. In this paper, we have brought different Census Bureau micro datasets together for the first time to examine potential explanations of productivity growth among firms in the retail sector.

In particular we focus on the role played by computer investment. There is a sense in the popular imagination that large, technically sophisticated retailers are displacing smaller retailers. It is also widely thought that an important part of the business plan of these larger sophisticated retailers is a heavy reliance on information technology. Thus, we examine the relationship between IT intensity and labor productivity and retail establishment growth.

We provide a variety of statistics to try to describe changes in the retail sector, at the micro level over the 1992 to 1997 period, and attempt to discern what role, if any, investment in IT had in them. We show that increases in retail establishments and employment are dominated by large continuing firms. Large firms also account for most of the investment in the retail sector. Using

some simple regressions, we find that there is a significant relationship between IT investment and retail productivity growth at the firm level. We do not find a significant relationship between IT spending and establishment growth at retail firms.

The patterns we see in the data are consistent with anecdotal evidence that many areas in retail are seeing large sophisticated companies introducing new technologies and processes and displacing less sophisticated retailers. However, there is more that needs to be done before we can more fully describe this process. We would like incorporate data from the Annual Retail Trade Survey so that we can analyze the relationship between computer investment and both value added per employee (rather than sales per employee) and inventories. Considerable data work needs to be done before we can do this, however. There is also more to do on examining how measures of technical sophistication like computer investment interact with entry and exit patterns of both firms and establishments to yield improved performance in the retail sector. Finally, we want to expand our analysis to cover other trade and services sectors that have witnessed large investments in IT.

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Table 1: Basic Facts for Retail and Wholesale Trade

	1992	1993	1994	1995	1996	1997	1998	1999
Output by Industry (billions, $1992)								
Total (GDP)	6,318.9	6,642.3	7,054.3	7,400.5	7,813.2	8,318.4	8,790.2	9,299.2
Trade	966.3	1,010.5	1,099.8	1,147.4	1,216.7	1,307.3	1,407.7	1,499.7
Retail	551.7	578.0	620.6	646.8	687.1	740.5	796.8	856.4
Wholesale	414.6	432.5	479.2	500.6	529.6	566.8	610.9	643.3
Manufacturing	1,082.00	1,131.4	1,223.2	1,289.1	1,316.0	1,379.6	1,436.0	1,500.8
Source: BEA, Gross Product by Industry								
Employ. (1000s)								
Total Nonfarm Employees	108,591	110,692	114,135	117,188	119,597	122,677	125,845	128,772
Trade	25,352	25,753	26,664	27,564	28,078	28,614	29,095	29,712
Retail	19,355	19,772	20,501	21,187	21,596	21,966	22,295	22,788
Wholesale	5,997	5,982	6,163	6,377	6,482	6,648	6,800	6,924
Manufacturing	18,106	18,076	18,323	18,526	18,496	18,675	18,806	18,543
Source: BLS								
Crude LP (1000s $1992/employee)								
Total	58.2	60.0	61.8	63.2	65.3	67.8	69.8	72.2
Trade	38.1	39.2	41.2	41.6	43.3	45.7	48.4	50.5
Retail	28.5	29.2	30.3	30.5	31.8	33.7	35.7	37.6
Wholesale	69.1	72.3	77.8	78.5	81.7	85.3	89.8	92.9
Manufacturing	59.8	62.6	66.8	69.6	71.1	73.9	76.4	80.9
Crude LP Growth (percent change from prior period)								
Total		3.1	3.0	2.2	3.4	3.8	3.0	3.4
Trade		2.9	5.1	0.9	4.1	5.4	5.9	4.3
Retail		2.6	3.6	0.8	4.2	6.0	6.0	5.2
Wholesale		4.6	7.5	0.9	4.1	4.4	5.4	3.4
Manufacturing		4.7	6.7	4.2	2.2	3.8	3.4	6.0

Table 2: Descriptive Statistics for all Retail Firms by Firm Size: 1992 and 1997

Employ. Size Class	0 - 9	10 - 19	20 - 49	50 - 99	100 - 499	500 +	Total
#Of Firms, 1992	814,902	137,236	84,545	22,402	10,794	1,858	1,071,737
#of Continuing Firms	370,866	79,615	53,073	15,181	7,941	1,463	528,139
#Of Firms, 1997	806,329	144,137	92,374	25,507	12,437	2,071	1,082,855
#of Establishments, 1992	814,902	157,301	119,455	50,661	81,634	292,250	1,526,215
Change dur to Net Entry	2,020	1,491	5,115	2,999	-1,660	-4,027	5,938
Change Due to Within Class Continuers	-1,367	-955	-1,046	-48	2,755	26,496	25,835
Change dur to Cross Class Continuers	-5,335	-4,314	-3,688	-385	2,925	14,004	3,207
#of Establishments, 1997	813,492	159,847	125,096	54,254	82,480	326,026	1,561,195
Employment in 1992	2,558,086	1,829,730	2,528,883	1,502,267	1,991,904	7,997,583	18,408,453
Net Change from Net Entry of Firms	-43,114	29,758	96,627	96,579	118,726	-173,340	125,236
Net Change Due to Within Class Continuers	91,528	12,710	38,330	23,244	96,250	1,949,521	2,211,583
Net Change Due to Corss Class Continuers	-37,184	54,669	99,820	90,940	74,764	138,581	421590
Employment in 1997	2,569,316	1,925,867	2,763,660	1,713,030	2,281,644	9,912,345	21,165,862

Source: authors calculations 1992 and 1997 Census of Retail Trade micro data files, Center for Economic Studies. Note "firm" refers to the operations of an enterprise within given 2 digit retail SIC. A firm with establishments in more than one 2 digit retail SIC will enter the data multiple times.

Table 3: Descriptive Statistics for All Retail Firms: 1992 and 1997

Employ. Size Class	0 - 9	10 - 19	20 - 49	50 - 99	100 - 499	500 +	Entrants	Exiters
Number 1992	814,902	137,236	84,545	22,402	10,794	1,858	NA	543,598
Number 1997	806,329	144,137	92,374	25,507	12,437	2,071	554,716	NA
Avg. LP, 1992	4.267	3.940	3.905	4.084	4.126	4.309	NA	4.016
Avg. LP, 1997	4.345	4.043	3.982	4.233	4.319	4.358	4.182	NA
Avg. Productivity Growth	-0.057	0.092	0.110	0.133	0.152	0.100	NA	NA

Source: authors calculations 1992 and 1997 Census of Retail Trade micro data files, Center for Economic Studies. Note "firm" refers to the operations of an enterprise within given 2 digit retail SIC. A firm with establishments in more than one 2 digit retail SIC will enter the data multiple times. Labor productivity is the natural log of sales per employee.

Table 4: Descriptive Statistics for Firms in Matched Subset: 1992 and 1997
(Totals unweighted - means weighted)

Employ. Size Class	0 - 9	10 - 19	20 - 49	50 - 99	100 - 499	500 +	Total
Number 1992	7,980	2,926	2,630	1,256	1,416	921	17,129
# of Continuing firms 1997	4,491	1,846	1,795	1,041	1,211	874	11,258
# of Establishments, 1992	8,963	4,288	5,683	4,600	20,286	217,893	261,713
# of Establishments at continuers, 1997	4,969	2,554	3,711	3,783	15,446	211,990	242,453
Employment, 1992	33,172	39,587	82,262	86,774	303,068	6,173,295	6,718,158
Employment at Continuers, 1997	19,594	25,359	56,294	72,834	258,456	7,014,329	7,446,866
Weighted Employment, 1992	2,449,588	1,825,845	2,490,578	1,322,791	1,939,591	6,402,616	16,431,498
Weighted Continuer Employment, 1997	1,687,191	1,236,309	1,783,687	1,150,962	1,752,776	7,272,146	14,883,071
Avg. weighted total Investment, 1992	5,269	14,337	30,668	80,934	419,151	14,505,062	-
Avg. weighted computer Investment, 1992	327	973	2013	6611	24823	968,478	-
Avg. weighted Computer share of total investment	0.080	0.093	0.085	0.081	0.074	0.071	-
Avg. weighted LP Growth	-0.051	0.092	0.162	0.124	0.072	0.120	-

Source: authors calculations 1992 and 1997 Census of Retail Trade and 1992 Assets and Expenditure Survey micro data files, Center for Economic Studies. Note "firm" refers to the operations of an enterprise within given 2 digit retail SIC. A firm with establishments in more than one 2 digit retail SIC will enter the data multiple times. Labor productivity is the natural log of sales per employee.

Table 5: Descriptive Statistics for Firm Investment
Matched Subset - 1992 and 1997

Investment Intensity Category	No Total Investment	LT; No IT	LT; LIT	LT: HIT	HT; No IT	HT; LIT	HT; HIT
#of Firm Observations	6,036	3,185	4,434	1,058	660	757	702
# of Establishments, 1992	10,345	24,516	93,939	17,883	6,770	42,972	35,405
# of Establishments at Continuers, 1997	6,661	22,359	83,538	16,102	7,404	45,778	35,118
Employment 1992	115,162	469,388	2,128,848	290,275	173,623	1,276,819	1,904,412
Employment at continuers 1997	85,626	439,216	2,093,623	285,278	200,076	1,475,648	2,486,125
Weighted Employment, 1992	3,164,505	2,871,504	4,664,406	783,048	724,765	2,032,257	2,191,014
Weighted Continuer Employment, 1997	2,225,994	2,514,524	3,902,154	626,411	740,286	2,062,428	2,809,275
Avg. weighted investment per $ payroll	0.0	0.061	0.113	0.143	1.306	0.313	0.989
Avg. weighted Conputer Investment per $ payroll	0.0	0.0	0.006	0.038	0.0	0.008	0.127
Avg. weighted Computer share of total investment	-	0.0	0.085	0.354	0.0	0.30	0.174
Avg. weighted LP, 1992	4.235	4.315	4.073	4.001	4.407	4.804	4.225
Avg. weighted LP, 1997	4.295	4.416	4.373	4.425	4.413	4.152	4.552
Avg. weighted LP Growth	-0.012	-0.016	0.042	0.027	-0.052	0.025	0.164

Source: authors calculations 1992 and 1997 Census of Retail Trade and 1992 Assets and Expenditure Survey micro data files, Center for Economic Studies. Note "firm" refers to the operations of an enterprise within given 2 digit retail SIC. A firm with establishments in more than one 2 digit retail SIC will enter the data multiple times. Labor productivity is the natural log of sales per employee. KEY: LT=Low Total, HT=High Total, LIT=Low IT, HIT=High IT

Table 6. Descriptive Statistics By Two-Digit SIC: All 1992 Firms

Two-Digit SIC	52	53	54	55	56	57	58	59
#of Firms, 1992	55,199	10,264	127,575	142,256	63,020	79,610	331,488	262,325
Avg. Employ., 1992	12	203	23	14	18	9	20	9
Avg. Survivor Employ., 1997	12	235	21	12	15	8	15	8
Avg.#of Establishments, 1992	1.3	3.4	1.4	1.4	2.3	1.4	1.3	1.3
Avg.#of Establishments at survivors, 1997	0.8	2.8	0.8	1.0	1.4	0.8	0.8	0.8
Avg. LP, 1992	4.60	4.28	4.43	5.09	4.16	4.52	3.40	4.30
Avg. Survivor LP, 1997	4.74	4.38	4.56	5.29	4.32	4.64	3.49	4.47
Avg. Change in LP at Survivors	1.8%	-7.3%	-3.4%	3.8%	-5.4%	-1.4%	-2.4%	1.7%

Source: authors calculations 1992 and 1997 Census of Retail Trade and 1992 Assets and Expenditure Survey micro data files, Center for Economic Studies. Note "firm" refers to the operations of an enterprise within given 2 digit retail SIC. A firm with establishments in more than one 2 digit retail SIC will enter the data multiple times. Labor productivity is the natural log of sales per employee.

Table 7. Descriptive Statistics By Two-Digit Industry: Matched Subset

Two-Digit SIC	52	53	54	55	56	57	58	59
# of Firm observations, 1992	783	640	1,278	3,390	2,436	2,851	1,497	3,957
Avg. Weighted Employ., 1992	11.7	215.0	22.6	13.9	15.4	8.8	22.2	8.8
Avg.Weighted Employ., 1997 (for continuers)	20.2	488.6	36.5	20.9	25.5	12.5	34.0	12.9
Avg.weighted # of Establishments, 1992	1.3	3.1	1.4	1.4	2.3	1.3	1.4	1.3
Avg. weighted # of Establishments, 1997	0.8	2.6	0.9	1.0	1.5	0.8	0.9	0.8
Avg. weighted LP, 1992	4.54	4.36	4.32	5.05	4.19	4.57	3.39	4.29
Avg.weighted LP, 1997	4.77	4.52	4.40	5.26	4.33	4.69	3.52	4.42
Avg.weighted Change in LP	3.7%	-6.7%	-3.1	3.2%	-3.0%	5.7%	-1.3%	0.2%
Avg. Weighted Capital Expenditures, 1992	29,688	1,078,551	47,463	27,291	24,346	16,999	31,282	17,571
Avg. Weighted Computer Expenditures, 1992	2879	87,568	1725	1864	2058	1705	988	1812
Avg. Weighted Capital Expenditures per $ of payroll, 1992	0.162	0.137	0.148	0.152	0.175	0.159	0.130	0.214
Avg. Weighted Computer Expenditures per $ of payroll, 1992	0.015	0.009	0.004	0.006	0.008	0.007	0.003	0.018

Source: authors calculations 1992 and 1997 Census of Retail Trade and 1992 Assets and Expenditure Survey micro data files, Center for Economic Studies. Note "firm" refers to the operations of an enterprise within given 2 digit retail SIC. A firm with establishments in more than one 2 digit retail SIC will enter the data multiple times. Labor productivity is the natural log of sales per employee.

Table 8: Labor Productivity Growth Regressions

Dependent Variable: log(sales/emp), Regressions are weighted by adjusted sample weights

Variable		Model 1		Model 2		Model 3	
		Coef.	St. Err.	Coef.	St. Err.	Coef.	St. Err.
Constant		0.310	0.177	0.092	0.107	0.122	0.108
	0 - 9	-0.176	0.114	-0.151	0.106	-0.150	0.106
	10 - 19	-0.020	0.114	-0.004	0.107	0.002	0.107
Employment	20 - 50	0.068	0.115	0.065	0.107	0.070	0.108
Size Class	50 - 100	0.025	0.118	0.004	0.112	0.012	0.112
	100 -500	-0.025	0.123	-0.008	0.114	-0.006	0.115
	500 +	-	-	-	-	-	-
IT Share				0.068	0.036	0.073	0.036
	No Cap, No IT	-0.173	0.032				
	Low Cap, No IT	-0.231	0.034				
Total	Low Cap, Low IT	-0.155	0.034				
and IT	Low Cap, High IT	-0.170	0.042				
Intensities	High Cap, No IT	-0.234	0.039				
	High Cap, Low IT	-0.159	0.046				
	High Cap, High IT	-	-				
Low Capital Intensity						-0.046	0.017
High Capital Intensity						-	-
SIC 52: Bldg Mat. and Hardware		0.013	0.027	-0.009	0.034	-0.009	0.034
SIC 53: Gem. Merch.		-0.093	0.064	0.029	0.083	0.030	0.083
SIC 54: Food Stores		-0.049	0.021	0.014	0.026	0.017	0.026
SIC 55: Auto Dealers &Gas Sta.		0.005	0.019	0.006	0.023	0.007	0.023
SIC 56: Apparel &Accessories		-0.032	0.029	0.017	0.041	0.016	0.041
SIC 57: Home Furniture &Equip.		0.057	0.023	0.096	0.028	0.099	0.028
SIC 58: Eating &Drinking Places		-0.054	0.017	-0.041	0.021	-0.040	0.021
SIC 59: Miscellaneous Retail		-	-	-	-	-	-
N / R^2		10919 / 0.025		7173 / 0.021		7173 / 0.022	

Table 9: Establishment Growth Regressions

Dependent Variable: log(sales/emp), Regressions are weighted by adjusted sample weights

Variable		Model 1		Model 2		Model 3	
		Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Constant		-0.008	0.042	-0.058	0.041	-0.051	0.041
	0 - 9	0.011	0.041	0.042	0.041	0.043	0.041
Employment	10 - 19	-0.002	0.041	0.037	0.041	0.039	0.041
Size Class	20 - 50	-0.020	0.042	0.017	0.042	0.018	0.042
	50 - 100	0.001	0.043	-0.011	0.043	-0.009	0.043
	100 -500	0.012	0.044	0.052	0.044	0.053	0.044
	500 +	-	-	-	-	-	-
IT Share				0.001	0.014	0.003	0.014
	No Cap, No IT	-0.019	0.011				
	Low Cap, No IT	-0.027	0.012				
Total and IT	Low Cap, Low IT	-0.023	0.012				
Investment	Low Cap, High IT	-0.020	0.015				
Intensities	High Cap, No IT	-0.013	0.014				
	High Cap, Low IT	-0.039	0.016				
	High Cap, High IT	-	-				
Low Capital Intensity						-0.011	0.007
High Capital Intensity						-	
SIC 52: Bld Mat. and Hardware		0.003	0.018	0.004	0.013	0.004	0.014
SIC 53: General Merchandise Stores		-0.003	0.023	-0.006	0.031	-0.006	0.031
SIC 54: Food Stores		0.013	0.007	0.019	0.010	0.020	0.010
SIC 55: Auto Dealers and Gas Sta.		0.023	0.008	0.027	0.009	0.028	0.009
SIC 56: Apparel and Accessories		-0.016	0.011	-0.040	0.015	-0.041	0.015
SIC 57: Home Furniture and Equip.		-0.0004	0.008	0.004	0.011	0.005	0.011
SIC 58: Eating and Drinking Places		0.041	0.006	0.024	0.008	0.025	0.008
SIC 59: Miscellaneous Retail		-	-	-	-	-	-
N / R^2		11,120 / 0.008		7,283 / 0.006		7,283 / 0.007	